

REMARKS/ARGUMENTS

Reconsideration and allowance in view of the foregoing amendment and the following remarks are respectfully requested.

Claim 1 was rejected under 35 USC 103(a) as unpatentable over Owen in view of Jones, Stine and Zenz. Applicant respectfully traverses this rejection.

On page 14 of the Office Action, the Examiner asserts that applicant's argument regarding positive and negative cyclones is not commensurate with the scope of the claims. Claim 1 has been amended above to provide more specifically that the separator vessel in which the cyclones are disposed has a pressure in excess of those encountered inside the cyclones. As the skilled artisan should understand or know, cyclones of separator vessels are generally positive, but in applicant's description, at paragraph [0021] as published, it is clear that in the case in question, the same was negative, that is, the primary cyclone is detached. Specifically, in the detailed description of the invention, in paragraph [0021], it is said "a pressure equilibrium is obtained between the inner lower part of the legs (5, 7) of the cyclones (3, 4) and the inside of the separator vessel (2), where the pressure is normally in excess of those encountered inside the cyclones. "A cyclone inside a separator vessel, the pressure of which is larger than that encountered inside the cyclone, is by definition a negative cyclone.

The present application deals with a system for cyclone leg sealing against re-entry of gases into the legs of cyclones in series. In the cyclone of this system, the catalyst levels in relation to junction (25) of legs of cyclones (21) and (22), as indicated in Figure 2, belong intrinsically to the instant case put to practice (concretization); those catalyst levels do not result from simple operational conditions, since if the operational conditions do not allow that the catalyst levels to be above of the junction (25), the

system loses efficiency to unacceptable levels, both economically and environmentally, mainly the latter.

The specification already describes that the junction of legs of the first and the second stages of cyclones in series is comprised in the state of the art (paragraph [0023]).

The application stresses throughout that the present invention allows an increase of the efficiency of functioning of the cyclones relative to the collection of particulate material with the consequent reduction of emission of particulate material, since the proposed configuration prevents particulate material already separated or collected from being re-entrained with the ascending gas which enters the cyclone legs, said gas coming from the catalyst bed (paragraph [0012]).

The application also emphasizes that, due to the absence of movable sealing parts, the system possesses mechanical and operational sturdiness, and therefore it is very reliable.

In the description of Fig. 2 (paragraph [0024]) the inventors at no moment explicitly affirm that the first-stage cyclone is directly connected to the riser. Therefore it is reasonable to apply it to the cases of a cyclone of separating vessels, provided that cyclones (21) and (22) operate at pressures smaller than the separating vessel (2). Furthermore, the inventors stress that the single leg (26) resulting from joining legs (23) and (24) has to be immersed in the fluidized bed (9), and, as shown in Fig. 2, which, and by itself can only describe one particular point of the patent. Also, junction point (25) of legs (23) and (24) must also be immersed in the fluidized bed (9) and also the catalyst levels in the legs have to be above the junction point (25). Those catalyst levels in no way result from operational conditions of fluidization of catalyst bed (9), but a necessary condition for the invention to prevent the entry of gas of the fluidized bed (9) inside of the single leg (26) towards junction (25) and consequently entraining particulate material from leg 24 towards the upper exit tube of the secondary cyclone.

The levels of particulate material above the junction (25) of the legs (23) and (24) are also a necessary condition for the functioning of the invention, lest a by-passing of gas should occur, of gas coming by leg (23) of the primary cyclone (21) towards leg (24) of the secondary cyclone through the junction (25). This will cause a loss of separation efficiency of the cyclone system to environmentally unacceptable levels nowadays. This is quite important, for in the past there was no environmental concern with the losses of particulates. The concern was solely of an economic nature, and, due to the need for making up the material, in order to recover the catalytic capacity of the inventory, losses were even acceptable. Otherwise there would be a need for draining or withdrawal, for the replacement of the particulate material.

A piece of information gotten during the experimental reduction to practice of the present invention is the reason that the non-occurrence is assured of a by-pass of gas coming by leg (23) of the primary cyclone (21) towards leg (24) of the secondary cyclone through the junction (25), when the level of particulate material inside the legs of cyclones (21) and (22) is above of the junction (25) is that the density of the material in the leg of the cyclone (22) fluid dynamically stabilizes in values above those in the leg of the cyclone (21), a fact completely different in conventional configurations of primary and secondary cyclones in series, and conferring, therefore, to the second stage a dynamic and perfect sealing, which results in the increase of the efficiency of collection of particulate material, which is the main content of Claim 1 of the present invention.

As to the application of the system, paragraph [0029] reaffirms that the present system is meant to be applied in a separating vessel (generally positive cyclones, but which can be negative, in conformity with the description given above, and which refers to paragraphs [0021] and [0022], that indicate the case where the present invention is for being applied) and for the regenerator vessel (generally negative cyclones). In this paragraph the inventors reaffirm that the fluidization level, via, the fluidization degree, does not affect the functioning of the system, because what is at stake is what is

described or implied in Fig. 2, that the catalyst level of the fluidized bed (9) be above the level in junction (25), and the legs of cyclones (23) and (24) be with level of particulate material also above junction (25).

On the slant of the cyclone legs, the Examiner in pages 4 and 5 argues that it does not matter if they are primary or secondary, since the catalyst will flow easily in both cases, either in applicant's or in the one of Owen et al. The Examiner, as to the catalyst flow, is partly correct, for there will be no difficulty in the flow but the Examiner did not realize that applicants are not claiming draining of the catalyst by the legs, but the sealing of the cyclone legs so that there is re-entry or flow of gas in the opposing direction of the draining of the catalyst, what causes a loss of collecting efficiency of the particulate material or catalyst from the cyclone.

With regard to the new Stine reference:

1.) The patent is for positive cyclones, that is, cyclones that are directly connected to a riser and with internal pressures larger than those in the medium where the legs unload the collected material;

2.) There was no concern with the cyclone collecting efficiency, just the assurance of the operational and economic aspects (making up of the catalyst versus price and necessity of discarding or withdrawal for the making up), and in applicant's patent application only the flow of the catalyst from the legs of cyclones into the risers are contemplated in the claims. If there had been a concern with the efficiency of collection of cyclones, the author would not present the configuration shown, which, after the publication of applicant's invention, would enable any person of ordinary skill to make the junction of the legs of cyclones (6) and (9) become installed almost next to the base of riser (3) such as to assure that the level of catalyst in the leg (8) was above the junction of the two legs of cyclones (6) and (9). This is why the configuration is not shown by Stine in the Figure, because he did not realize the importance of this aspect, which is only important for the collection efficiency but not for the simple flowing of the

catalyst. Another hypothesis also, is that he may have feared the reversion of gas of the cyclone (6) towards the leg of the cyclone (9), from leg (8) to leg (12). In the case of cyclones (17) and (20) also connected to a riser (13), the concern also was only with the catalyst flow. Again here, after the application is published, it becomes easy for any person of ordinary skill to say that it was enough to immerse the standpipe of regenerated catalyst (18), as well as its junction with leg (21) of cyclone (20), inside the fluidized catalyst bed (24), since in the form shown in the Figure, the losses by the cyclones would be currently unacceptable, even then in 1966, date of the present patent application, this aspect could be rejected in the environmental and economic standpoint.

3) As Stine shows, the levels of catalyst in the legs or standpipes (18) and (8) will be always below the junctions, for the densities of these legs or standpipes are much higher than the ones of risers (13) and (3) respectively, and therefore the pressure balances will not require high levels of catalyst in the legs. Anyhow, nowhere does Stine say that the levels of catalyst in legs (8) and (18) need to be above of the junction of these with legs (12) and (21), respectively. This is because, for him, the operation of legs without any concern for levels was safer and more reliable, since the efficiency of cyclones was not a required factor at the time. It was due to a complete lack of knowledge of the detailed gas-solid fluid dynamics and flow, and also due to lack of creativity, that no regular expert of the area, considered the possibility of the invention now under examination. The solution proposed by the inventors is not mentioned in any book on cyclones, but it only looks easy or obvious on hindsight, after it is disclosed.

As noted in the prior response, Owen's application is applicable to Positive Cyclones Systems, as depicted by its picture, where the primary cyclone (65) inlet is connected to a rise (51). In contrast, Claim 1 is now limited to a Negative Cyclone System. As noted in the prior response, as a consequence, the pressures at the top of the cyclones' dip legs are lower than those at the fluidized bed vessel (31). This

difference is fundamental to determine the proper performance for the invention. Applicant's invention works better in both cases, although applicant's invention is directed to Negative Cyclone Systems. It is well known in the state of the art of cyclones, that there are no sealing problems in Positive Cyclone Systems. That is why Owen uses two separated plenum chambers in his invention, besides the sulfur reduction in streams for posterior treatment plenum chamber 79 for the Positive Cyclone System (comprising cyclones 65 and 67) and another one (plenum chamber 93) for the Negative Cyclone (89). Besides, it is important to emphasize that the Negative Cyclone (89) uses a movable conventional sealing (probably a trickle valve), the elimination of which applicant's invention is advancing, due to its low performance.

As also noted previously, Owen provides sealing means at the termination of the combined dip legs. The Examiner cites the secondary reference to Jones as allegedly teaching terminating a cyclone separator leg distally in a radius curved termination that is devoid of movable sealing parts. Applicant respectfully disagrees for the reasons of record.

Indeed, Applicant respectfully submits that Jones does not teach the combination claimed devoid of movable sealing parts. Quite the contrary, Jones' invention specifically provides for a mechanical closure on a dip leg that is selectively released and, thus, expressly teaches a movable sealing part.

The Examiner asserts that Jones' sealing plate is only present when catalyst is introduced and is only temporary and will be removed during operation by the presence of a weight to pull a metal plate out of position or by forming the sealing means from a material that will partly or wholly fuse or rupture or disintegrate. However, the Examiner has by this admission acknowledged that Jones does teach a mechanical sealing part for the distal end of his dip leg and does teach that at least a part of the mechanical closure is movable. As such, Jones does not anticipate an open distal

termination that is devoid of movable sealing parts at all times. The Jones invention expressly provides for a mechanical closure placed on the dip leg.

Even if Jones is considered to teach a radius curved termination that is devoid of movable sealing parts, Jones does not teach or suggest such a termination for a common dip leg of multiple cyclones, much less for a separator leg joining a leg of a secondary cyclone and a primary cyclone.

It is further respectfully submitted that Owen clearly and irrefutably teaches sealing means at the end of his common dip leg. Since Jones does not teach or suggest that the sealing means can be omitted or eliminated from such a common dip leg, it is respectfully submitted that the skilled artisan would not obviously replace the sealing means of Owen with a radius termination as in Jones. Only applicant teaches that a termination devoid of movable parts may be incorporated at the termination of a common dip leg from different cyclone stages. Importantly that feature of the invention is not an isolated characteristic but must be considered in combination with the remaining features of applicant's independent claim 1, including the location of the fluidized particles with respect to the junction of the dip legs and the vertical orientation of the dip leg of the primary cyclone and inclined orientation of the dip leg of the secondary cyclone. This combination is clearly not taught or suggested by the prior art combination cited by the Examiner.

Thus, Owen/Jones does not anticipate the combination claimed because neither Owen nor Jones teach, in combination, (1) the level of the fluidized bed located above that junction; (2) a substantial vertical primary cyclone leg and an inclined secondary dip leg; and (3) the separator leg terminates in a radius-curved separator leg termination that is devoid of movable sealing parts.

The Examiner says, in the middle paragraph of page 4 of the Office Action mailed 10/31/2007, that the connecting configuration of legs 69 and 71 in Owen et al. is similar to applicant's, except that in Owen et al. the configuration is reversed - in

applicant's the leg of the primary cyclone is straight and the leg of the secondary cyclone is inclined. Examiner goes on in the next and last paragraph saying that said reversal would be obvious ("obvious matter of design choice") on the basis of suitability for the intended use and absent a showing of unexpected results thereof. Applicant here respectfully disagrees that unexpected results are not shown, because, contrary to what the Examiner says a little further on in the same paragraph, that applicant's invention does not solve a stated problem, applicant's invention does solve a stated problem. "Bad functioning and stream failures" -page 5, last paragraph, reasons submitted on 21 August, 2007. The problems are disclosed in detail in the state-of-the-art section of applicant's specification, and also in other passages, like "it is practically impossible to prevent some re-entrainment of catalyst particles back inside the cyclone".

Owen's application is applicable to Positive Cyclones Systems, as depicted by its picture, where the primary cyclone (65) inlet is connected to a riser (51), therefore with the fluidized bed vessel (73) pressure being lower than pressures at the cyclones dip legs from the primary and secondary cyclones. Now applicant is claiming an invention for Negative Cyclones Systems, because the primary cyclone (21) inlet is at the same pressure as the fluidized bed vessel, therefore the pressures at the top of cyclones dip legs are lower than those at the fluidized bed vessel (31). This difference is fundamental to determine the proper performance for the invention. Applicant's invention works better in both cases, although applicant is only claiming Negative Cyclone Systems. It is well known in the state of art of cyclones, that there are not sealing problems in Positive Cyclone Systems. That is why Owen uses two separated plenum chambers in his invention, besides the sulfur reduction in streams for posterior treatment plenum chamber 79 for the Positive Cyclone System (comprising cyclones 65 and 67) and another one (plenum chamber 93) for the Negative Cyclone (89). Besides, it is important to emphasize that the Negative Cyclone (89) uses a moveable

conventional sealing (probably a trickle valve), the elimination of which applicant's invention is advancing, due its low performance.

The installation requirement for the primary cyclone dip leg to be in a vertical position is fundamental to this application, because it avoids the gas disengagement at the junction point due to the direction change induced when using a slanted dip leg for the primary cyclone, and the disengaged gas will flow towards the secondary cyclone dip leg causing a drop in the collecting efficiency. Using a slanted primary cyclone dip leg connected to a vertical secondary cyclone as taught by Owen's application will allow the ejection phenomenon at junction point 25, but due to the change of the catalyst flow direction from slanted to vertical, catalyst and gas flow inside the first stage cyclone dip leg (71) arriving at the junction point will be divided in two directions. Most of this catalyst and gas stream will then go down to the fluidized bed 73, but a significant amounts of catalyst and gas will flow up towards the second stage cyclone dip leg 69, negatively affecting the collecting efficiency - it is more suitable to use a conventional seal for the second stage cyclone dip leg, such as a trickle valve.

With reference to the Examiner's response to the arguments submitted August 21, 2007, it is respectfully noted that Stine's Figure does not establish limitations to all the applications as the Examiner seems to imply, according to the reasons already given herein. It is not only the manner of operation, it has to do with the constructive form/installation of the system in relation to the fluidized catalyst bed, said catalyst bed being a part of the physical reduction to practice of the apparatus. It is not just the result of an operational variable as the Examiner would like to suggest.

As to page 13 of the remarks by the Examiner, the Examiner should ask why in the literature of cyclone technique, there is nothing similar to applicant's proposal to increase the particulate collection efficiency in cyclones, through the increase of the reliability of the sealing of the cyclone legs. The Examiner should do this instead of alleging, after being aware of applicant's invention, that anyone with ordinary skill could

do it. By reverse thinking, once what one wants to reach, it becomes easy to select isolated characteristics here and there that, when combined, will enable someone to reach the desired result, the subject matter of applicant's invention. But in the actual field conditions, one cannot get to the results easily. Moreover, applicant's invention improved the collection efficiency of cyclone collection. That would not be easily seen by a layperson in the subject. If so, others would have claimed it previously.

As to page 14 of the Examiner's remarks, it is not common to speak in positive cyclones or negative for the people of regular knowledge in the subject, the correct one is in agreement with what the inventors had described in paragraph [0021] of the published application; the cyclones have lesser pressures or inferior of the vessel where they are installed or they unload the collected material.

In this regard, the Examiner should understand or know that cyclones of separating vessel are generally positive, but in applicant's description of paragraph [0021], it is clear that in the case in question the same was negative, that is, the primary cyclone is detached (please see Exxon's closed cyclone; it seems disconnected but it is not); and in the case of regenerative vessels, they are generally negative.

As noted above, the newly cited references do not overcome the deficiencies of Owen and Jones with respect to the invention claimed.

For all the reasons advanced above, it is respectfully submitted that the combination of Owens, Johns, Stine and Zenz does not teach or suggest the invention specifically defined in applicant's claim 1.

Claim 6 was rejected under 35 USC 103(a) as unpatentable over Owen, Jones, Stine and Zenz and further in view of Jahnke. Applicant respectfully traverses this rejection.

With regard to the Jahnke reference, the Examiner committed another slip of interpretation. Jahnke relates to entrainment of gas from inside a leg into the bed

differently from what the present patent application deals with. Even so, it is an interesting patent, because in this patent the author strengthens the need of using movable valves to prevent this entrainment, even with the legs being immersed inside the fluidized catalyst bed. Any way, the Examiner should be alerted that the main source of loss of efficiency is the by-pass of gas of the leg of the primary cyclone (23) directly to the leg of the secondary cyclone (24), a thing that happens through the junction of these legs (25), what leads to an almost total loss of the efficiency of the secondary cyclone. However, if the catalyst level is above the junction inside these legs, this problem does not exist, and better still, there is a substantial improvement in the sealing of the leg of the secondary cyclone, leading to an expressive increase in the collection efficiency of the secondary cyclone.

As to page 17 of the Examiner's remarks, last paragraph, the Examiner must understand that in industrial equipment, there exists the limitation of the total length of a piece of equipment, either for mechanical, economic, physical, chemical, electrical, spatial aspects, and others cyclones cannot have limitless lengths.

Applicant has provided in detail at pages 9-10 of the August 21, 2007 response, incorporated herein by reference, the significance of applicant's length limitation, which analysis is completely lacking in the art the Examiner has cited.

Another point to be considered refers to the Examiner mistakenly and repeatedly referring to some feature in applicant's invention being obvious "on the basis of suitability for the intended use and absent a showing of unexpected results"

This happens not only in the page 4 as already cited but also in page 3, last paragraph, continued on page 4, first paragraph:

...IT WOULD HAVE BEEN obvious to modify [apparatus of Owen et al.] "on the basis of suitability for the intended use and absent a showing of unexpected results"

This happens again in page 6, last paragraph, when the Examiner says that selecting an appropriate length would also be obvious on the basis of "on the basis of suitability for the intended use and absent a showing of unexpected results" when Examiner rejects Claim 6.

The Examiner mentions the newly added limitation of a "given level" of the fluidized bed of particulates (catalyst) relative to the junction point. The Examiner did not explain that what he calls "given level" is a set of well defined conditions, fully accounted for in the specification, and they have to be selected for the purposes of applicant's invention in such a manner that the matter that is claimed is met. The invention determines the process conditions that are to be used, not the other way around. For instance, process conditions such that the level (9) of the catalyst bed would be too low to reach the junction would never be selected. It is different from just having an intention to operate the apparatus in a certain manner.

Applicants select a set of process conditions so that the invention will work. Here is the way applicants proceeded: applicants started from a known configuration, then applicants modified one part and another, then applicants evaluated the performance of the modified configuration. If performance got worse, applicants reverted the change or tried another value for the said change. If applicants modified the apparatus in such a way that the performance was better, applicants went on, until applicants reached a configuration which was so promising that applicants decided to apply for the patent! The Examiner is not completely mistaken, however, because probably, in some parts, but only in some parts of the development, applicants knew that for some intended use, a certain piece of equipment or a certain combination of pieces of equipment had never been used, and applicants would not even try it. If applicants had been bold enough to try a completely out-of-standard piece of

equipment, applicants might have hit on another invention, for which applicants would also apply for a patent!

Since Owen et al refers to a method concerning a combination of operating parameters mainly to reduce sulfur, although applicants concede that it uses cyclones, the attention of someone of ordinary skill would NOT be drawn to a minor detail such as separators 65 and 67 being sequentially connected since they are mentioned in a casual way, just as a matter of fact and just once. Anyhow, applicants also gladly concede the point the Examiner has repeatedly tried to prove that it is already shown in Owen et al., which is the joining of the diplegs. In the words of applicant's specification:

"The joining of the legs of a primary cyclone and a secondary cyclone, such that the solid material is collected by both cyclones and discharged by means of a single valve at the end of the combined leg section of the cyclones, is also a known technique. In this technique, the reduction of catalyst losses grew more efficient."

This corresponds to the fact that the two diplegs (in Owen et al.) 69 and 71 combine, just like applicant's, in a single termination, but, on the other hand, as already exhaustively discussed in previous responses to previous Official Actions, there are two things in Owen et al. which are different from applicant's and would actually teach away from applicant's: firstly, the junction point in Owen et al. is above the catalyst level -- different from applicant's Figure 3 --- and secondly, there is a sealing means. In applicant's, an essential feature is that the termination is devoid of movable sealing parts. Happily, in this last point the Examiner has finally conceded that Owen et al. is different from applicant's. So the Examiner had to add in another reference - Jones - to try to find a basis for arguing lack of inventiveness. Then the Examiner added another reference in the next Official Action. And so on. This has been the usual way the Examiner has proceeded, by combining a large number of references, and to each reply, more references are introduced. But applicants think that even someone with

GREAT skill would not have been able to assemble applicant's invention from the state-of-the-art, by searching and selecting the conditions of applicant's system from the large number of existent possibilities.

Applicant acknowledges Examiner's citation, on page 10, in the last paragraph of the Action mailed on October 31, 2007, of a Board decision which "held that the amount of submersion is immaterial to the structure of the mixer and thus the claim was properly rejected". But there was a condition, viz., "if the prior art teaches all the structural limitations of the claim". And "the claim was rejected over a reference which taught all the structural limitations of the claim for the intended use of mixing flowing developer material". In applicant's, the Examiner combined Owen et al., Jones, Stine et al. and Zenz, so there was not a reference, but four references to establish what the Examiner called prior art. The Examiner should look at the combination of elements in applicant's application, and at the problem-solving effect therein. This is a different thing from a prior art consisting of just one plain reference. As stated in the specification, the prior art does not solve the problems principally those in which the physical arrangement of the primary and secondary cyclones does not allow the joining of the cyclone legs.

For all the reasons advanced above reconsideration and withdrawal of the Examiner's rejection of claim 6 is solicited.

Claim 3 was rejected under 35 USC 103(a) as being unpatentable over Owen, Jones, Stine and Zenz and further in view of Danielsen. Claim 3 is submitted to be patentable over the primary combination for the reasons advanced above. The Examiner's further reliance on Danielsen does not overcome the deficiencies of the primary references noted above. In fact, Danielsen also teaches away from the invention by providing a movable sealing part at the distal end of the leg structure. It is therefore respectfully submitted that claim 3 is also allowable over the prior art of record.

Claims 4 and 5 were rejected under 35 USC 103(a) as being unpatentable over Owen, Jones, Stine and Zenz and further in view of Luckenbach and Linden. These claims are submitted to be patentable over the primary combination for the reasons advanced above. The Examiner's further reliance on Luckenbach and Linden does not overcome the deficiencies of the primary combination noted above.

It is further respectfully submitted that Lukenbach does not teach or suggest that the radius curved portion of Owen/Jones could or should be formed from a plurality of straight pipe sections. In the case of Lukenbach, a single pipe part 14 is provided at an incline. Lukenbach does not teach that his inclined part is formed from a series of straight pipe sections; only a single pipe section is shown forming this component. Likewise, Lukenbach provides no teaching or suggestion whatsoever regarding using straight pipe sections to form a radius curve. In fact, if Luckenbach's teachings were followed in Owen/Jones, then Owen/Jones would provide a single straight segment at an incline as depicted in Lukenbach, rather than the single curved pipe. It is therefore, respectfully submitted that any proper combination of Owen/Jones and Lukenbach would still not anticipate nor render obvious the plural straight portions applicant claims in claims 4 and 5.

It is further respectfully noted that claim 5 provides that the succession of straight tube sections directs the mass flow against phase particles into a plane orthogonal to the ascending gas flow. This is not true of Jones as Jones clearly directs mass flow at an acute angle to and in the same direction as the gas flow, as understood from Figure 2. Thus, Jones does not teach or suggest a curve directing mass flow in a plane orthogonal to the gas flow direction. Lukenbach also fails to teach or suggest directing flow in a direction orthogonal to the gas flow because Lukenbach teaches mass flow directed downwardly at an acute angle to and in the opposite direction from the gas flow. Thus, any proper combination of Jones and Luckenbach does not anticipate nor render obvious claim 5 either.

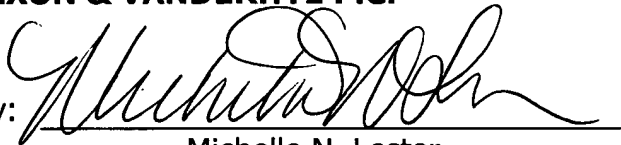
RAMOS et al.
Appl. No. 09/725,165
April 29, 2008

It is therefore respectfully submitted that claims 4 and 5 are also patentable over the prior art of record.

All objections and rejections having been addressed, it is respectfully submitted that the present application is in condition for allowance and an early Notice to that effect is earnestly solicited.

Respectfully submitted,

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